Lagrangian Studies of Submesoscale Coherent Vortices in the California Current System

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LONG-TERM GOALS

Our long-term goal is to understand the kinematics and dynamics of the California Current System and to apply this knowledge to naval and maritime operations in Eastern Boundary Current regions.

SCIENTIFIC OBJECTIVES

Along the Central and Northern California coast, subsurface floats routinely encounter submesoscale coherent vortices. The occurrence of these vortices is common enough that they have an important role in the offshore transport of properties from the coastal zone to the deep sea. The specific objectives of this study are to determine (1) when, where and how these vortices are formed, and (2) their role in mixing and transporting equatorial and subarctic waters.

APPROACH

Our goals are accomplished through the collection of shipboard CTD and ADCP data in the Central California area, moored observations of currents, and subsurface (RAFOS) float measurements. This project launched triads of RAFOS floats in conjunction with mesoscale-resolving hydrographic surveys of the California Current off Central California.

WORK COMPLETED

In both May and November 1998, a triad of RAFOS floats were launched in poleward flow over the middle of the continental slope to the south of 36°N. Subsequently, hydrographic surveys were carried out along the Central California coast between 36°N and 38°N. The hydrographic surveys revealed a submesoscale feature only at Davidson Seamount.

Six floats that were launched in 1997 surfaced. These data were processed and the floats navigated. Sources off Pt. Arguello, Moss Landing, and Cape Mendocino were monitored using the NPS Ocean Acoustic Observatory at Point Sur.

RESULTS

Float trajectories constructed in 1998 showed two unusual features. Floats that were launched in poleward flow south of Point Sur left the coast at Point Sur and moved westward for the remainder of

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their mission. Second, floats launched to the north of Point Sur were carried far to the north---one float surfaced near 48°N.

IMPACT/APPLICATIONS

1997 trajectories indicate strong, sustained poleward flow along the West Coast of the U.S., consistent with our understanding of observed El Niño conditions. The extent of offshore flow at Point Sur was also surprising: a direct path from the continental slope through the California Current to the interior of the Northeast Pacific Ocean.

TRANSITIONS

The techniques and methods used to analyze these data have been applied to the development of tactical decision aids for mine warfare.

RELATED PROJECTS

Related projects involve analysis of shipboard observations of El Niño conditions along CalCOFI line 67, participation in Central California cruises sponsored by the Naval Oceanographic Office, and the use of RAFOS floats to track hydrothermal plumes in the region of Juan de Fuca Ridge. We collaborated with scientists at LANL to study the behavior of "numerical" floats in their high-resolution numerical ocean model.

PUBLICATIONS

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